
The Larval and
Reproductive Biology of
the Giant Crab
Pseudocarcinus gigas

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*Submitted in fulfilment of the requirements for the degree of
Doctor of Philosophy
University of Tasmania
September 1998*

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Abstract

This thesis documents research on two aspects of the biology of the giant crab *Pseudocarcinus gigas*: the development, behaviour, and rearing of the larvae; and the reproductive biology of both sexes.

Larvae were reared from hatch to juvenile crabs. The larval development of 5 zoeal and one megalopal stages were described which permitted identification of *P. gigas* larvae from plankton samples. Samples from different depths were sorted to obtain information on vertical migration patterns, although few *P. gigas* larvae were collected.

Vertical migration was further investigated in experiments which analysed the swimming response to gravity, light intensity, change in light intensity, light wavelength, change in pressure, current, temperature, and thermoclines. Response to temperature involved a feed-back mechanism that positioned larvae at temperatures optimal for growth, survival, and metamorphosis to megalopa (14-16°C). Light intensity and photoperiod had little effect on survival although larvae reached megalopa most rapidly with long photoperiod and high intensity and were smaller in continuous darkness treatments. Cannibalism of stage 1 and 2 zoeas was highest with long photoperiod and low intensity.

Mycosis and epibiotic fouling of larvae necessitated trials with prophylactic treatments. Survival was highest with a broad spectrum antibiotic (oxytetracycline) while promising results were obtained with carbendazim and copper oxychloride. Suitable concentrations for indefinite baths were established by monitoring toxic effects as increased mortality, deformity, prolonged intermoult, or death during moulting.

The male reproductive tract is typical of brachyurans with ovoid, enveloped, spermatophores stored in the mid vas deferens (MVD). Males pass through three morphological stages (of chela development) and individuals from all three stages had spermatophores in the MVD. Mating pairs were never observed but patterns of limb loss indicate that mating involves female-centred competition. Females appear to mate while soft-shelled with stored sperm remaining viable for at least four years. Broods are produced annually although females occasionally skip a reproductive season, which may be associated with moulting. Several broods may be produced between moults although fecundity declines with successive broods. The hepatopancreas underwent little change in composition during gonadogenesis. Fecundity increased with female size, although not in a simple cubic (volumetric) relationship as larger females produced larger eggs. This increase in egg size was associated with a significant, albeit small, decrease in protein and carotenoid, and an increase in moisture, while lipid appeared unaffected. Protein was used preferentially to lipid during embryogenesis. Techniques for immobilising, humanely killing, and internal imaging of crabs were employed for research on reproduction and are described.

Acknowledgments

Advice provided by my supervisors, Dr Greg Maguire and Dr Howel Williams, was invaluable throughout the project for improving experimental design and manuscripts.

Assistance in obtaining crabs was provided by several skippers and processors including Theo Hairon (Galaxy Fishing Co.), Ian Coatsworth and Richard Pugh (St Helens Aquaculture), Justin Cohen (Tas Crays), Michael Hardy and Barry (Stanley Fish), and Sam Gregg (Stormboy). Additional crabs from Victoria were collected with the help of Andrew Levings and with support from the Victorian Department of Conservation and Natural Resources, especially from Ari Vlassopoulos.

Description of the larval stages was possible through the guidance of Dr Rudolfo Quintana (Aquatlas), the help of Dr K. Konishi who produced computer images of the first larval stage, and the loan of equipment from Ass. Prof. Alistair Richardson. Larval rearing was achieved with the advice and assistance of Debbie Gardner, Michel Bermudes, Polly Butler, Alan Beech, Cameron Johns, Michael Northam, Sid Saxby, Robert Browne, Danny Roden, Peter Farrell and Greg Commerford. Larval rearing containers were donated by Pacific World Packaging through Jim Foote.

Plankton samples were made available by Mark Lewis and Barry Bruce (CSIRO) and assistance with sorting was provided by Erica Aheimer, Andrew Trotter and Josephine Walker. Samples of eggs, ovaries and hepatopancreas were counted and analysed with the help of Peter Machin, Justin Guest, Dean Thompson, Ben Verbeeten, Kris McKinley and Maggie Muttius. X-Ray imaging of female crabs was by Phillip Thomas and Michael Eland, while Martin Rush and Tim Bevilacqua of the Royal Hobart Hospital assisted with CT and MRI scanning.

Many people assisted with improving drafts of individual chapters including Stewart Frusher, Bob Kennedy, Dr Don Fielder, Dr Paul Clark, Dr Barry Munday, Dr Barbara Nowak, Jenni Bruce, Dr Peter Beninger, and Prof. Nigel Forteach.

Staff at the Taroona Marine Research Laboratories were a pleasure to work around and this project benefited from the positive atmosphere.

Lastly, the contribution of my partner Sha-sha Kwa was enormous. She helped with much of the research work, has improved the thesis by proof reading and formatting, tolerated a messy house etc. etc. I'm very grateful.

Facilities and financial support was provided by the Aquaculture Department, University of Tasmania, the Australian Postgraduate Awards, and the Tasmanian Department of Primary Industry and Fisheries.

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